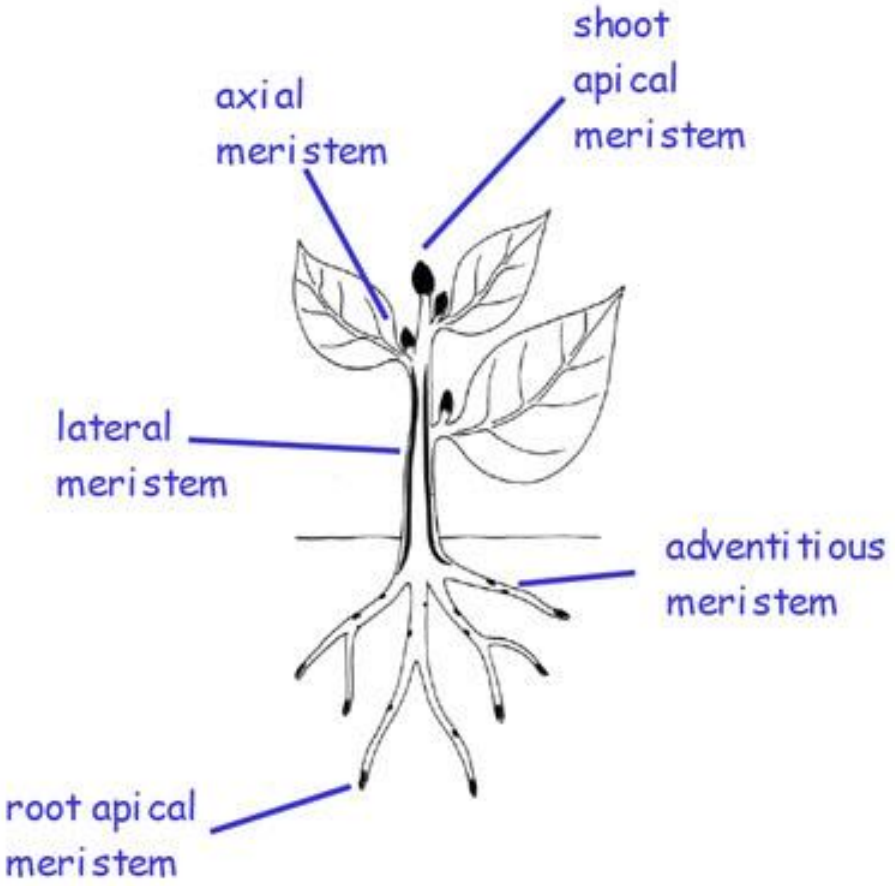
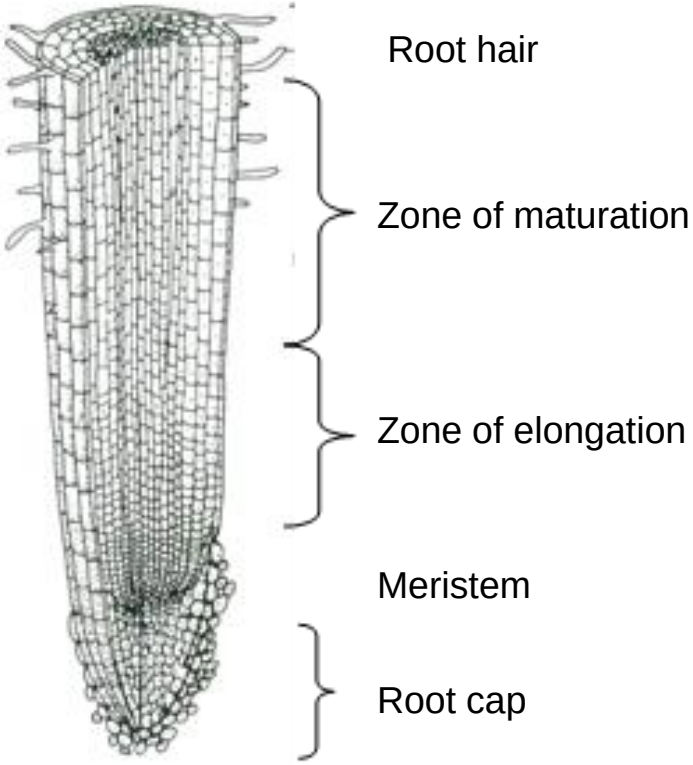
4.6 Plant Growth and Development

Meristems

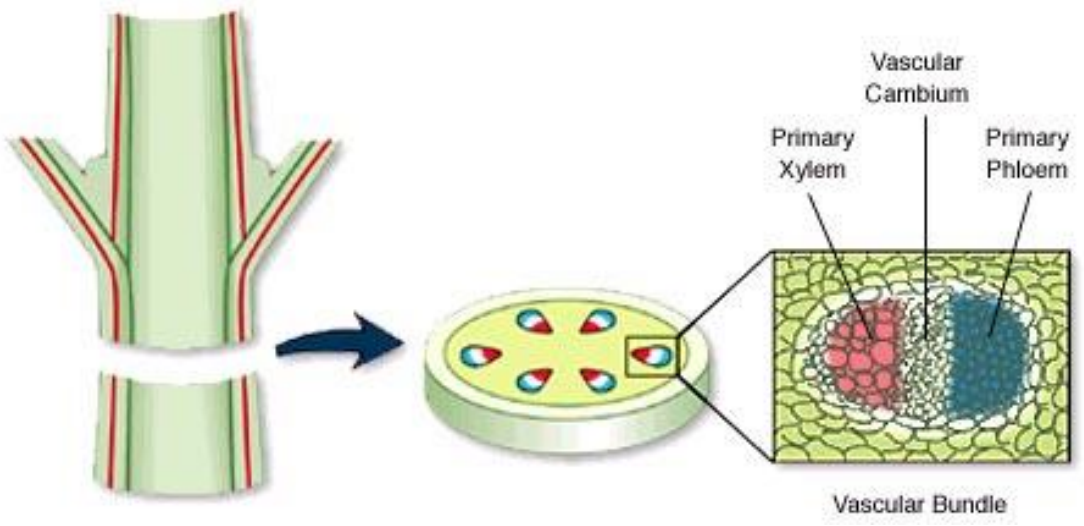
- Region of unspecialized cells where there is rapid cell division
- Sites of new growth on a plant – floral bud, leaf bud, root tip etc.
- New cells have thin walls and dense cytoplasm. As they age they grow longer and begin to develop specific functions.
- 2 major types: Apical and lateral meristems



1. Apical meristems – for primary growth, at the tips of roots and the tips of shoots



2. Lateral meristems – for secondary growth, includes vascular cambium which gives rise to new xylem and phloem, and cork cambium which gives rise to bark. Increases the plant's diameter.



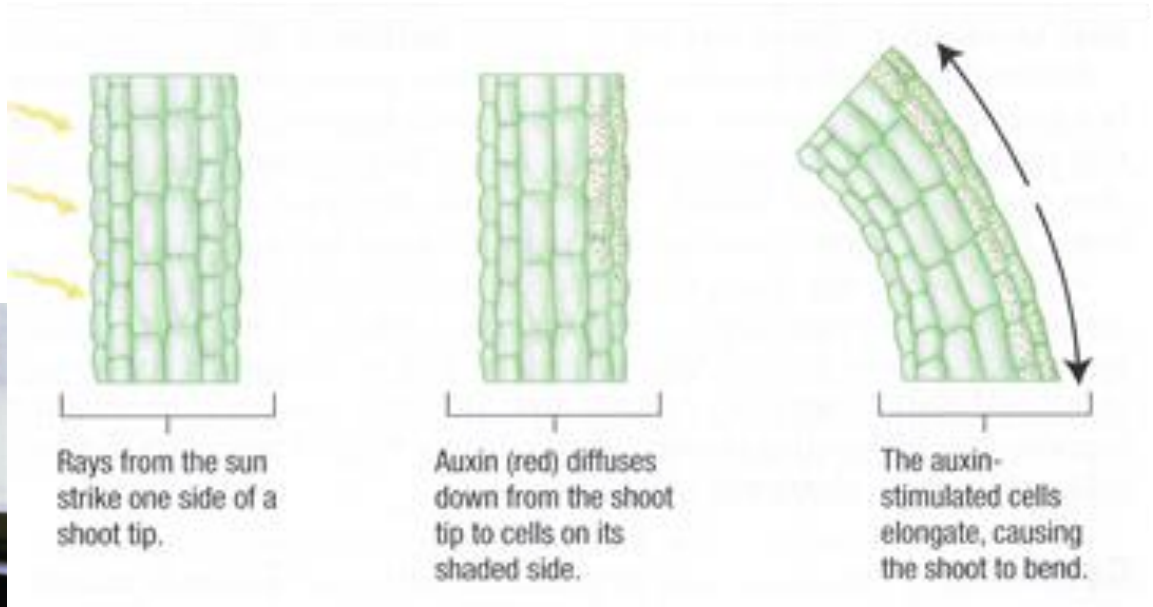
Plant Growth Regulators

- Plants are able to modify their growth and differentiation through the action of chemicals called “plant growth regulators”.

- There are five plant growth regulators that are found in most plants:

1) Auxins (awk-sin)

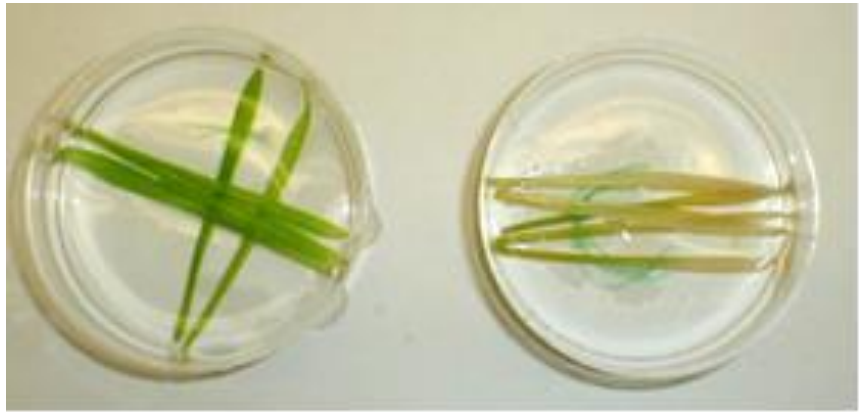
- Promotes cell elongation
- allows plants to respond to light



- Gibberellins (jib-uh-rel-in)
  - Promotes cell division and cell elongation, depending on the tissue they are affecting.
  - Highly variable.
  - Important role in flowering and fruit production (grape growers).
  - Induces fruit production and cause fruit stem elongation, which gives more space for each individual to grow.

3) Cytokinins (sahy-tuh-kahy-nin)

- All promote cell division.
- Slow cell aging in certain plant organs by inhibiting protein breakdown and stimulating protein synthesis.
- synthetic cytokinin are commonly sprayed on lettuce and mushrooms to keep them from spoiling
- delay (death) in wheat leaves



4) Ethylene

- Is a plant growth regulator (gas) that is produced by plants at various stages of development.
- Important in fruit ripening, shoot and root growth and differentiation, flower opening, leaf and fruit drop.
- Fruits release ethylene as they ripen, which induces further ripening and eventually spoilage.
- Fruit produces therefore try to control ethylene levels.
- Well-ventilated trunks, ethylene absorbing filters, ship sensitive fruits and vegetable separately.
- Also release ethylene into shipping containers so that produce ripens at the same time.

5) Abscisic acid (ABA) (ab-sis-ik, -siz-)

- Inhibits growth.
- ABA levels rise in response to changes in temperature and light.
- Promotes dormancy on leaf buds and seeds until correct environment conditions are available.
- ABA closes stomata when environmental conditions are dry.
- Dormant plants are less vulnerable to damage than actively growing plants. Grasses become dormant and turn brown during hot, dry periods in summer.

Tropism: is a change in the direction of growth or movement of a plant in response to a stimulus. Tropisms are controlled by **plant growth regulators.**

- **Gravitropism** – a change in the direction of growth in response to gravity

2) Thigmotropism (thig-mo-truh-piz-uh m)

- a change in the direction of growth in response to touch

3) Phototropism – a change in direction of a growing plant in response to light.